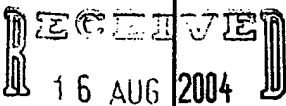


PATENT COOPERATION TREATY

CONFIRMATION

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

| | | | | | |
|---|--|---|--|---|--|
| To: Lawrence Y.D. HO 30 Bideford Road #07-02/03 Thongsia Building SINGAPORE 229922 | |  | | PCT WRITTEN OPINION (PCT Rule 66) | |
| | | | | Date of mailing (day/month/year) 11 AUG 2004 | |
| Applicant's or agent's file reference 1007.P056PCT/KJT/ayu | | | REPLY DUE within ONE MONTH from the above date of mailing | | |
| International Application No. PCT/SG2003/000204 | | International Filing Date (day/month/year) 29 August 2003 | | Priority Date (day/month/year) 29 October 2002 | |
| International Patent Classification (IPC) or both national classification and IPC Int. Cl. ⁷ H01L 21/50, 21/304 | | | | | |
| Applicant ADVANCED SYSTEMS AUTOMATION LIMITED et al | | | | | |


- This written opinion is the **second** drawn by this International Preliminary Examining Authority.
- This opinion contains indications relating to the following items:
 - ☒ Basis of the opinion
 - ☐ Priority
 - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - ☐ Lack of unity of invention
 - ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - ☐ Certain documents cited
 - ☐ Certain defects in the international application
 - ☒ Certain observations on the international application
- The **FINAL DATE** by which the international preliminary examination report must be established according to Rule 69.2 is:
28 February 2005
- The applicant is hereby invited to reply to this opinion.

When? See the Reply Due date indicated above. However, the Australian Patent Office will not establish the Report before the earlier of (i) a response being filed, or (ii) one month before the **Final Date** by which the international preliminary examination report must be established. The Report will take into account any response (including amendments) filed before the Report is established. If no response is filed by 1 month before the **Final Date**, the international preliminary examination report will be established on the basis of this opinion.

Applicants wishing to have the benefit of a further opinion (if needed) before the report is established should ensure that a response is filed at least 3 months before the **Final Date** by which the international preliminary examination report must be established.

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis. For an informal communication with the examiner, see Rule 66.6.

| | |
|---|--|
| Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929 | Authorized Officer  I.A. BARRETT Telephone No. (02) 6283 2189 |
|---|--|

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed.
- ☒ the description, pages 1-15, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☒ the claims, pages , as originally filed,
pages , as amended under Article 19,
pages , filed with the demand,
pages 16-21, received on 13 July 2004 with the letter of 13 July 2004
- ☒ the drawings, pages 1-12, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-----|
| Novelty (N) | Claims 1-30 | YES |
| | Claims | NO |
| Inventive step (IS) | Claims 1-30 | YES |
| | Claims | NO |
| Industrial applicability (IA) | Claims 1-30 | YES |
| | Claims | NO |

2. Citations and explanations

The prior art cited discloses singulation of packaged semiconductor devices where a packaged substrate is moved from a loading location to a cutting location, cutting is performed in a first, then a second, direction, followed by transporting from the cutting location to an unloading location where singulated packages are unloaded. This is different from the invention of independent claims 1 and 17. Claims 1 and 17 require the packaged substrate to be partially cut while mounted on a first movable mount, then transferred to a second movable mount where further cutting produces singulated packages, which are then unloaded at an unloading location. The prior art does not disclose transferring the packaged substrate from a first to a second mount between cutting steps. The attorneys letter of 13 July 2004 has asserted that this allows concurrent operations to be performed on two moulded substrates, with cutting performed at a common location. It appears that it would require an inventive step over the prior art to arrive at the invention claimed. Claims 1-30 are considered novel and inventive.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The claims are not fully supported by the description. Page 1 line 6-8 (Field of the Invention) states that the invention relates to semiconductor singulation using a water jet system. The claims are not limited to *water jet* singulation, and include all forms of singulation (eg dicing saws). The attorneys letter of 13 July 2004 has asserted that there is no legal basis for limiting the claims to what the field of the invention states. There is clear basis for this in Article 6 of the PCT, which requires the claims to be fully supported by the description. It is clear from PCT Rule 5.1(a)(i) that the field of the invention is to be considered part of the description. It is also clear from reading the description as a whole that a technical feature of the invention is that singulation is performed by a water jet system. This is clearly stated in the field of the invention. The description does not envisage any other singulation means and actively teaches away from alternatives such as sawing and laser singulation at pages 1-4. PCT Rule 6.3(a) requires the claims to be in terms of the technical features of the invention. A claim omitting a technical feature of the invention (singulation performed by a water jet system) would not be fully supported by the description.

Claims

1. A handler for singulating at least one packaged substrate into a plurality of packaged semiconductor devices, the handler comprising:

a first movable mount for moving between a loading location and a cutting location, the first movable mount adapted to receive the at least one packaged substrate at the loading location, the first movable mount for transporting the at least one packaged substrate from the loading location to the cutting location, and the first movable mount adapted to secure the at least one packaged substrate thereon while the at least one packaged substrate is at least partially cut at the cutting location; and

a second movable mount for moving between the cutting location and an unloading location, the second movable mount adapted to receive the at least one packaged substrate that is at least partially cut at the cutting location, the second movable mount for securing the at least one packaged substrate thereon while the at least one packaged substrate is at least partially cut at the cutting location to produce at least some of the plurality of packaged semiconductor devices, and the second movable mount for transporting the at least some of the plurality of packaged semiconductor devices from the cutting location to the unloading location.

2. A handler in accordance with claim 1, further comprising at least one cutting tool disposed at the cutting location, the at least one cutting tool suitably adapted for cutting the at least one packaged substrate.

3. A handler in accordance with claim 2, wherein the at least one cutting tool comprises at least one water jet from at least one water jet nozzle.

4. A handler in accordance with claim 3, wherein the at least one water jet includes abrasive material.
5. A handler in accordance with claim 4, further comprising a distance detector mounted proximal the at least one water jet nozzle, the distance detector for detecting the distance between the at least one water jet nozzle and the at least one packaged substrate when cutting the at least one packaged substrate with the at least one water jet, and the distance detector for providing a detected distance.
6. A handler in accordance with claim ~~[[7]]~~ 5 further comprising a movable mount for mounting the water jet thereto, the movable mount being coupled to receive an adjusted distance, the movable mount for maintaining a predetermined distance between the water jet and the at least one packaged substrate when cutting the at least one packaged substrate with the water jet, in accordance with the adjusted distance.
7. A handler in accordance with claim 1 further comprising at least one transport guide that extends from the loading location, through the cutting location, and to the unloading section, wherein at least the first movable mount is movably coupled to the at least one transport guide.
8. A handler in accordance with claim 7 wherein the at least one transport guide comprises at least a pair of rails, and wherein at least the first movable mount is movably coupled to the pair of rails.
9. A handler in accordance with claim 8 wherein at least the second movable mount is movably coupled to the pair of rails.

10. A handler in accordance with claim 9 wherein the pair of rails are substantially linear and extend substantially parallel to each other from the loading location, through the cutting location, and to the unloading location.
11. A handler in accordance with claim 1 wherein the first movable mount comprises a rotatable vacuum chuck for securing the at least one packaged substrate thereto.
12. A handler in accordance with claim 11 wherein the second movable mount comprises a rotatable vacuum chuck for securing the at least one packaged substrate thereto.
13. A handler in accordance with claim 1, further comprising a movably mounted image capture device directed at the loading location for capturing at least one image of the at least one packaged substrate on the first movable mount, when the first movable mount is at the loading location.
14. A handler in accordance with claim 1, further comprising a second image capture device directed at the cutting location for capturing at least one image of the at least one packaged substrate on the second movable mount, when the second movable mount is at the cutting location.
15. A handler in accordance with claim 1, further comprising a transfer means for transferring the at least one packaged substrate from the first moveable mount to the second movable mount.
16. A handler in accordance with claim 1, wherein the transfer means comprises at least one pick and place assembly mounted to operate at the cutting location.

17. A method for handling at least one packaged substrate for singulation into a plurality of packaged semiconductor devices, the method comprising:

a) providing:

a first movable mount for moving between a loading location and a cutting location; and

a second movable mount for moving between the cutting location and an unloading location,

b) moving the first movable mount from the loading location to the cutting location with the at least one packaged substrate disposed thereon;

c) cutting the at least one packaged substrate in a first reference direction at the cutting location;

d) transferring the at least one packaged substrate from the first movable mount to the second movable mount;

e) cutting the at least one packaged substrate in a second reference direction, different from the first reference direction, at the cutting location, to produce the plurality of packaged semiconductor devices; and

f) moving the second movable mount from the cutting location to the unloading location.

18. A method in accordance with claim 17 further comprising, prior to (b), loading the at least one packaged substrate on the first movable mount.

19. A method in accordance with claim 17 further comprising, after (f), unloading the plurality of packaged semiconductor devices on the second movable mount.

20. A method in accordance with claim 17, wherein step (a) further comprises providing a water jet for cutting the at least one packaged substrate in (c).
21. A method in accordance with claim 17, wherein (a) further comprises providing a water jet for cutting the at least one packaged substrate in (e).
22. A method in accordance with claim ~~[[17]]~~ 21 further comprising, after (b) but before (c), aligning the at least one packaged substrate with the water jet.
23. A method in accordance with claim ~~[[17]]~~ 21 further comprising, after (d) but before (e), aligning the at least one packaged substrate with the water jet.
24. A method in accordance with claim 17 wherein (b) further comprises moving the second movable mount from the cutting location to the unloading location with at least another previously singulated packaged substrate disposed thereon.
25. A method in accordance with claim 24 wherein (c) further comprises unloading the at least another previously singulated packaged substrate at the unloading location.
26. A method in accordance with claim 20 wherein (c) further comprises moving the first movable mount in the first reference direction.
27. A method in accordance with claim 20 wherein (c) further comprises moving the water jet in the second reference direction.

28. A method in accordance with claim 21 wherein (e) further comprises moving the second movable mount in the first reference direction.

29. A method in accordance with claim 21 wherein (e) further comprises moving the water jet in the second reference direction.

30. A method in accordance with claim 17, wherein (d) comprises picking the at least one packaged substrate off the first movable mount, moving the first movable mount from the cutting location to the loading location, moving the second movable mount from the unloading location to the cutting location, and placing the at least one packaged substrate on the second movable mount.

Claims

1. A handler for singulating at least one packaged substrate into a plurality of packaged semiconductor devices, the handler comprising:

a first movable mount for moving between a loading location and a cutting location, the first movable mount adapted to receive the at least one packaged substrate at the loading location, the first movable mount for transporting the at least one packaged substrate from the loading location to the cutting location, and the first movable mount adapted to secure the at least one packaged substrate thereon while the at least one packaged substrate is at least partially cut at the cutting location; and

a second movable mount for moving between the cutting location and an unloading location, the second movable mount adapted to receive the at least one packaged substrate that is at least partially cut at the cutting location, the second movable mount for securing the at least one packaged substrate thereon while the at least one packaged substrate is at least partially cut at the cutting location to produce at least some of the plurality of packaged semiconductor devices, and the second movable mount for transporting the at least some of the plurality of packaged semiconductor devices from the cutting location to the unloading location.

2. A handler in accordance with claim 1, further comprising at least one cutting tool disposed at the cutting location, the at least one cutting tool suitably adapted for cutting the at least one packaged substrate.

3. A handler in accordance with claim 2, wherein the at least one cutting tool comprises at least one water jet from at least one water jet nozzle.

4. A handler in accordance with claim 3, wherein the at least one water jet includes abrasive material.
5. A handler in accordance with claim 4, further comprising a distance detector mounted proximal the at least one water jet nozzle, the distance detector for detecting the distance between the at least one water jet nozzle and the at least one packaged substrate when cutting the at least one packaged substrate with the at least one water jet, and the distance detector for providing a detected distance.
6. A handler in accordance with claim 5 further comprising a movable mount for mounting the water jet thereto, the movable mount being coupled to receive an adjusted distance, the movable mount for maintaining a predetermined distance between the water jet and the at least one packaged substrate when cutting the at least one packaged substrate with the water jet, in accordance with the adjusted distance.
7. A handler in accordance with claim 1 further comprising at least one transport guide that extends from the loading location, through the cutting location, and to the unloading section, wherein at least the first movable mount is movably coupled to the at least one transport guide.
8. A handler in accordance with claim 7 wherein the at least one transport guide comprises at least a pair of rails, and wherein at least the first movable mount is movably coupled to the pair of rails.
9. A handler in accordance with claim 8 wherein at least the second movable mount is movably coupled to the pair of rails.

10. A handler in accordance with claim 9 wherein the pair of rails are substantially linear and extend substantially parallel to each other from the loading location, through the cutting location, and to the unloading location.
11. A handler in accordance with claim 1 wherein the first movable mount comprises a rotatable vacuum chuck for securing the at least one packaged substrate thereto.
12. A handler in accordance with claim 11 wherein the second movable mount comprises a rotatable vacuum chuck for securing the at least one packaged substrate thereto.
13. A handler in accordance with claim 1, further comprising a movably mounted image capture device directed at the loading location for capturing at least one image of the at least one packaged substrate on the first movable mount, when the first movable mount is at the loading location.
14. A handler in accordance with claim 1, further comprising a second image capture device directed at the cutting location for capturing at least one image of the at least one packaged substrate on the second movable mount, when the second movable mount is at the cutting location.
15. A handler in accordance with claim 1, further comprising a transfer means for transferring the at least one packaged substrate from the first moveable mount to the second movable mount.
16. A handler in accordance with claim 1, wherein the transfer means comprises at least one pick and place assembly mounted to operate at the cutting location.

17. A method for handling at least one packaged substrate for singulation into a plurality of packaged semiconductor devices, the method comprising:

a) providing:

a first movable mount for moving between a loading location and a cutting location; and

a second movable mount for moving between the cutting location and an unloading location,

b) moving the first movable mount from the loading location to the cutting location with the at least one packaged substrate disposed thereon;

c) cutting the at least one packaged substrate in a first reference direction at the cutting location;

d) transferring the at least one packaged substrate from the first movable mount to the second movable mount;

e) cutting the at least one packaged substrate in a second reference direction, different from the first reference direction, at the cutting location, to produce the plurality of packaged semiconductor devices; and

f) moving the second movable mount from the cutting location to the unloading location.

18. A method in accordance with claim 17 further comprising, prior to (b), loading the at least one packaged substrate on the first movable mount.

19. A method in accordance with claim 17 further comprising, after (f), unloading the plurality of packaged semiconductor devices on the second movable mount.

20. A method in accordance with claim 17, wherein step (a) further comprises providing a water jet for cutting the at least one packaged substrate in (c).
21. A method in accordance with claim 17, wherein (a) further comprises providing a water jet for cutting the at least one packaged substrate in (e).
22. A method in accordance with claim 21 further comprising, after (b) but before (c), aligning the at least one packaged substrate with the water jet.
23. A method in accordance with claim 21 further comprising, after (d) but before (e), aligning the at least one packaged substrate with the water jet.
24. A method in accordance with claim 17 wherein (b) further comprises moving the second movable mount from the cutting location to the unloading location with at least another previously singulated packaged substrate disposed thereon.
25. A method in accordance with claim 24 wherein (c) further comprises unloading the at least another previously singulated packaged substrate at the unloading location.
26. A method in accordance with claim 20 wherein (c) further comprises moving the first movable mount in the first reference direction.
27. A method in accordance with claim 20 wherein (c) further comprises moving the water jet in the second reference direction.

28. A method in accordance with claim 21 wherein (e) further comprises moving the second movable mount in the first reference direction.

29. A method in accordance with claim 21 wherein (e) further comprises moving the water jet in the second reference direction.

30. A method in accordance with claim 17, wherein (d) comprises picking the at least one packaged substrate off the first movable mount, moving the first movable mount from the cutting location to the loading location, moving the second movable mount from the unloading location to the cutting location, and placing the at least one packaged substrate on the second movable mount.